AN ROINN OIDEACHAIS
(Department of Education).

BRAINSE AN MHEÁN-OIDEACHAIS
(Secondary Education Branch).

INTERMEDIATE CERTIFICATE EXAMINATION, 1933.

SCIENCE (Syllabus A).

MONDAY, 19th JUNE.—AFTERNOON, 4 TO 6 P.M.

[Not more than *six* questions to be attempted. All questions carry equal marks. Illustrate your answers wherever possible.]

1. Using an ordinary scale divided into inches and tenths, what is the greatest error you would be likely to make in measuring the length of an object? Describe in detail, using a sketch, how you would use an instrument with a vernier attachment in making a measurement more accurately. (Assume that the length to be measured is 3·27 inches.)

2. How is Oxygen usually prepared and collected in the laboratory? State exactly what you observe when you burn (*a*) magnesium, (*b*) sulphur in a jar of oxygen. If you did each combustion three times in separate jars, what tests would you apply to the contents of the six jars to find out the properties of the products of combustion. Set out in tabular form the results you would expect.

3. Distinguish, by describing simple experiments, between convection and conduction. Give two practical examples in ordinary life of the use of each of these methods of transference of heat.

4. State the principle known as the "Triangle of Forces." Sketch the apparatus you would use and describe how you would use it to demonstrate the truth of the principle. (Assume that you use forces of 3, 4 and 5 lbs. weight.)

5. A straight lever, suspended at its centre of gravity, has a 20 gm. weight suspended 23 cm. from the fulcrum. It is balanced successively by the following weights, suspended at the distances from the fulcrum given in the table:—

Weight in gms.	10	20	30	40	50	70	100
Dist. in cm. ...	46	23	15·3	11·5	9·2	6·6	4·6

Draw a graph of these results. What can you deduce from it? From the graph determine the weight of an object that will balance the 20 gm. weight when the object is 30 cm. from the fulcrum.

6. Name and describe the products that are obtained when limestone is strongly heated. What chemical elements would you require to make a compound of the same chemical constitution as limestone? How would you proceed to make it?

7. What is meant by the coefficient of apparent expansion of a liquid?

The following are the results of an experiment:—

Weight of density bottle ... ... = 40·23 gm.
Weight of bottle filled with a liquid at 15°C. = 87·00 gm.
Weight of bottle, etc., after being heated from 15°C. to 30°C. ... ... = 86·28 gm.

From these results calculate the mean coefficient of apparent expansion of the liquid between 15°C. and 30°C. Describe in detail how you would conduct the experiment.

8. Define the "Centre of Gravity" of a body? How would you determine experimentally the centre of gravity of a piece of cardboard of irregular shape?

A circular disc of 10″ diameter is suspended by a loosely fitting pin at a point A, 2″ from its centre. It is kept in equilibrium with its plane vertical and the diameter through A horizontal, by a weight of 2 lbs. suspended from the end of this diameter. Draw a sketch of the disc showing the forces acting on it and calculate its weight, giving reasons for your method.

9. A solid object of circular section, half the length of which is cylindrical while the other half tapers to a point, floats in a liquid of specific gravity 0·83, with the conical portion out of the liquid. What is the density of the object?

State the principle on which your answer is based.

10. You are given some rock salt. How would you deal with it to procure a dilute solution of Hydrochloric Acid? Sketch your apparatus. How would you show experimentally the reaction of the acid itself with ammonia gas?

11. Two beakers, one containing water and the other an equal quantity of paraffin oil at the same temperature, are put in turn over the same bunsen flame for three minutes. It is found that the paraffin has got much hotter than the water did. What property of the liquids caused this difference? How is it measured?

500 gm. of water at 20°C. are heated over a bunsen burner. In 7 minutes the water begins to boil and in 15 minutes more 160 gm. of water have boiled away. What value does this give for the latent heat of vaporisation of water?

12. A loaded wooden box, weighing in all 80 lbs. is dragged along a level pavement by a child who holds the string at an angle of 30° to the ground. The coefficient of friction between the box and the ground is $\frac{1}{4}$. How much work does the child do in dragging the box 10 yards? What is the tension of the string?